

CERTIFICATE

By Authority Of THE UNITED STATES OF AMERICA Legally Binding Document

By the Authority Vested By Part 5 of the United States Code § 552(a) and Part 1 of the Code of Regulations § 51 the attached document has been duly INCORPORATED BY REFERENCE and shall be considered legally binding upon all citizens and residents of the United States of America. HEED THIS NOTICE: Criminal penalties may apply for noncompliance.

This Document Posted By
Public.Resource.Org, Inc.,
a California Nonprofit
Organization.



Not Affiliated Or
Authorized by ASTM
or by the United States
Government

Document Name: ASTM C509: Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material

CFR Section(s): 24 CFR 200, Subpart S

Standards Body: American Society for Testing and Materials



Official Incorporator:
THE EXECUTIVE DIRECTOR
OFFICE OF THE FEDERAL REGISTER
WASHINGTON, D.C.

Standard Specification for CELLULAR ELASTOMERIC PREFORMED GASKET AND SEALING MATERIAL¹

This standard is issued under the fixed designation C 509; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification applies to those cellular elastomeric compounds of a firm grade that are manufactured in preformed shapes for use as gaskets and for use as sealing materials, in the form of compression seals or gaskets, or both, for glazing purposes.

NOTE 1—For softer cellular elastomeric materials used in secondary sealing applications, refer to Specification D 1056.

1.2 The following precautionary caveat pertains only to the test method portion, Section 11, of this specification: *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Applicable Documents

2.1 ASTM Standards:

D 395 Test Methods for Rubber Property—Compression Set²

D 412 Test Methods for Rubber Properties in Tension^{2,3}

D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact³

D 865 Test Method for Rubber Deterioration by Heating in Air (Test Tube Enclosure)

D 925 Test Methods for Rubber Property—Staining of Surfaces (Contact, Migration, and Diffusion)²

D 1056 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber³

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber (Flat Specimens)²

3. Terminology

3.1 Definition:

3.1.1 *cellular elastomer*—a cured elastomeric material containing cells or small voids.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *compression seal*—a type of joint seal in which weathertightness is maintained by the exertion of compressive pressure on the gasket or sealing material.

3.2.2 *gasket glazing*—a method of setting glass or panels in prepared openings, using a preformed gasket to obtain a weathertight seal.

3.2.3 *preformed gasket*—an elastomeric compound molded in the form of a continuous strip, channel, or other shape, for use in filling joints and providing weathertight seals in glazing or between building components.

3.2.4 *sealing material*—any material intended for use in providing weathertight seals in building applications.

4. Significance and Use

4.1 Flame Propagation:

¹ This specification is under the jurisdiction of ASTM Committee C-24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.72 on Compression Seal Gaskets.

Current edition approved Oct. 26, 1984. Published February 1984. Originally published as C 509 – 63 T. Last previous edition C 509 – 79.

² *Annual Book of ASTM Standards*, Vol 09.01.

³ *Annual Book of ASTM Standards*, Vol 09.02.

4.1.1 This specification has two options:

4.1.1.1 *Option I*—Flame propagation test is required.

4.1.1.2 *Option II*—Flame propagation test is not required.

4.1.2 In case no option is specified, Option I will apply.

4.1.3 *The sections of this specification applicable to flame propagation should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

4.2 This specification has two classifications as related to ozone resistance. These are Type I and Type II, with the latter having the greater resistance to ozone. The type should be specified when making reference to this specification but in the event that the type is not specified, Type I shall apply.

NOTE 2—Type II is included in this specification for use where greater ozone resistance is required.

5. Materials and Manufacture

5.1 Cellular elastomeric materials furnished to this specification shall be manufactured from natural rubber, synthetic rubber, rubber-like materials, or mixtures of these, with added compounding ingredients of such nature and quality that, with proper curing, the finished product will comply with this specification.

5.2 The cured compounds shall be suitable for use where resistance to sunlight, weathering, oxidation, and permanent deformation under load are of prime importance.

5.3 The manufacturing process shall be such to ensure a homogeneous cellular material free of defects that may affect serviceability.

5.4 Although under this specification the manufacturer is permitted to choose constituent materials, there is no implication that the several compounds are equivalent in all physical properties. Any special characteristics other than those required by this specification, which may be needed for specific applications, shall be specified by the purchaser, since such characteristics

may influence the choice of base materials and other ingredients.

6. Physical Properties

6.1 The material shall conform to the requirements prescribed in Table 1.

7. Dimensional Tolerances

7.1 Permissible variations in dimensions of the various forms shall be $\pm 6\%$ unless otherwise agreed upon between the purchaser and the supplier.

8. Workmanship, Finish, and Appearance

8.1 The cellular elastomeric materials shall be manufactured and processed in a careful and workmanlike manner in accordance with the best commercial practices.

8.2 The surfaces of the finished material shall be reasonably smooth and free of excessive talc or bloom.

8.3 Unless otherwise specified, the material shall be black. When colored material is desired, it is recommended that other tests, agreed upon between the purchaser and the supplier, be conducted to ensure color stability.

9. Sampling

9.1 When possible, the completed manufactured product of a suitable section thereof shall be used for the tests specified. Representative samples of the lot being examined shall be selected at random as required.

9.2 When the finished product does not lend itself to testing or to the taking of test specimens because of complicated shape, small size, metal or fabric inserts, or other reasons, standard test strips shall be prepared. The standard extruded specimens for testing, except where a specific specimen size is defined by a particular test method, shall be 6.4 mm ($\frac{1}{4}$ in.) thick by 32 mm ($1\frac{1}{4}$ in.) wide in rectangular cross section. The test pieces for flame propagation tests shall be as specified in 11.8.2. All test pieces shall be made from the same compound and shall have the same apparent density and state of cure as the product they represent.

9.3 The tests for dimensional stability, ozone resistance, water absorption, and nonstaining may be made on samples from the material to be shipped or on samples representative of it. Tests for compression deflection, compression

set, heat aging, flame propagation, and low-temperature brittleness may be made on standard samples previously prepared in accordance with 9.2.

10. Number of Tests and Retests

10.1 Any material that fails in one or more of the test requirements may be retested by making two additional tests for the requirements in which failure occurs. Failure in one such retest shall be cause for final rejection.

10.2 Rejected material shall be disposed of as directed by the supplier.

11. Test Methods

11.1 *Compression - Deflection* — Specification D 1056. Base calculations of compression-deflection on the original thickness of the specimens.

11.2 *Compression Set*—Test Methods D 395, Method B.

11.3 *Compression Deflection After Heat Aging*:

11.3.1 A 152-mm (6-in.) length of the finished extrusion shall be heat aged along with the specimen for Specification D 1056 and shall pass the requirements of Table 1, Footnote B.

11.3.2 Test for compression-deflection by first aging the specimen (a piece of appropriate size for the compression-deflection test, instead of the dumbbell-shaped tension specimen) in accordance with Test Method D 865, then measuring the compression-deflection value in accordance with Specification D 1056.

11.3.3 The specimen for heat aging shall be large enough to allow the taking of the appropriate number and size of specimens as defined by Specification D 1056. The cutting of specimens for Specification D 1056 shall be done after the heat aging has been performed.

11.4 *Dimensional Stability After Heat Aging*—Determine the dimensional stability by subjecting a 150-mm (6-in.) length of the extruded shape to heat aging for 70 h at 100°C (212°F) in accordance with Test Method D 865. After aging, the changes in length and breadth dimensions of the specimen shall not exceed 4 %.

11.5 *Ozone Resistance*—Test Method D 1149. The concentration of ozone shall be 100 MPa for Type I and 300 MPa for Type II. The time of test shall be 100 h at 40°C (104°F) with a specimen as defined by 9.2 with a length of 152 mm

(6 in.) and with a specimen elongation of 40 %.

11.6 *Low - Temperature Brittleness*—See Appendix X1.

11.7 *Water Absorption*—Test for water absorption by placing ten 460-mm (18-in.) strips of the elastomer, bent in a U-form, in water at 21.1°C (70°F) for a period of 24 h. Submerge only the center 406 mm (16 in.) of the specimen with the bottom of the loop 152 mm (6 in.) below the water line, and the cut ends of the specimen out of the water. After removal from the water, blot the specimens with lint-free paper before weighing. The test value is the average weight of water absorbed by the ten specimens.

11.8 *Flame Propagation*—This method determines whether or not the gasket will propagate flame, with no significance being attached to such matters as fuel contribution, rate of flame spread, smoke generation, or nature and temperature of products of combustion.

11.8.1 Apparatus:

11.8.1.1 The test chamber may be any enclosure that will permit normal gravity circulation of air past the specimen during burning. A hood or ventilated spray booth is recommended in order to remove any noxious products of combustion, provided the velocity of air past the specimen does not exceed 18.3 m (60 ft)/min.

NOTE 3—Air velocities greater than 18.3 m/min will have an extinguishing effect upon any flame and will present an unrealistic evaluation of the flame resistance of the material.

11.8.1.2 The burner shall be a bunsen burner with a barrel nominally 9.5 mm (0.38 in.) in diameter.

11.8.1.3 The fuel shall be ordinary fuel gas at a normal pressure.

11.8.2 The test specimen shall be 13 mm (½ in.) thick, 25 mm (1 in.) wide, and 460 mm (18 in.) long made in accordance with 9.2. It shall be free of any permanent set producing a curved section within the specimen that will not permit it to hang vertically, and it shall be free of abnormally porous sections and foreign materials.

NOTE 4—This method recognizes the fact that every flame, no matter how hot, has a kindling height above which its temperature is too low to kindle the specimen. For the specified flame, this height is considerably less than 460 mm (18 in.), so if a specimen burns above this kindling height, it does so on its own heat of combustion. Therefore it is considered to propagate flame.

11.8.3 Procedure:

11.8.3.1 Secure the specimen in a vertical position within the test chamber using a ring stand with a clamp positioned at the top of the specimen. Locate the specimen high enough to permit the burner to be placed beneath it. Use two wire loops to retain the position of the sample over the flame. Place one wire loop 51 mm (2 in.) from the end to be ignited, the other 127 mm (5 in.) from the end to be ignited. Fasten the wire loops to the stand holding the specimen.

11.8.3.2 Light and adjust the burner so as to produce a blue flame approximately 38 mm (1.5 in.) high.

11.8.3.3 Place the lighted burner directly below the specimen so that the tip of the inner cone of the flame just touches the lowest part of the specimen. Allow the burner to remain in this position for 5 min, then remove it.

11.8.3.4 After removal of the burner, remove loose char with a stiff brush and measure the remaining length of the specimen. Consider the unburned length to be that remaining after removal of loose char.

11.8.4 *Report*—The report should state the distance of flame propagation expressed in millimetres (or inches). The distance of flame propagation equals original length less unburned

length.

11.9 *Nonstaining*—Test Methods D 925, Method B. The surface against which stain is to be tested and the acceptable degree of staining shall be specified by the purchaser.

12. Inspection

12.1 All tests and inspections shall be made at the place of manufacture prior to shipment unless otherwise specified. The supplier shall provide the purchaser, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification.

13. Certification

13.1 When required, the supplier shall furnish the purchaser with a certified test report giving the results of the tests required to determine conformance with all requirements specified herein.

14. Packaging and Package Marking

14.1 All material shall be properly separated according to compound, size, etc., and shall be packaged and labeled in accordance with the best commercial practice with ample protection against damage in shipment.

Table 1 Physical Requirements of Cellular Elastomeric Materials

Property	Limit	ASTM Test Method ^d
Compression-deflection, 25 % deflection limits:		
kPa	91 to 168	D 1056
psi	13 to 24	
Compression set, 22 h @ 70°C (158°F) max, %	30	D 395, Method B
Heat aging ^b , 70 h @ 100°C (212°F), change in compression-deflection values:		
kPa	0 to +70	D 865 and D 1056
psi	0 to +10	
Dimensional stability, change, max %, after heat aging, 70 h @ 100°C (212°F)	4	11.4
Ozone resistance ^c at 40 % elongation, 100 h @ 40°C (104°F):		
Type I 100 MPa ozone	no cracks	D 1149
Type II 300 MPa ozone	no cracks	D 1149
Low-temperature brittleness @ -40°C (-40°F)	pass	see Appendix X1
Water absorption, max, % weight	5.0	11.7
Flame propagation:		
Option I	100 mm (4 in.) max.	11.8
Option II	no limit	
Nonstaining ^d	no migratory stain	D 925

^a See Section 11.

^b After heat aging, surfaces of the specimen shall be neither hard nor brittle. A 150-mm (6-in.) length of the finished extrusion shall exhibit no surface cracks when bent on itself 180°.

^c The specimen shall exhibit no surface cracks when in the extended condition.

^d This requirement may be waived, subject to agreement between the purchaser and the supplier.

APPENDIX

(Nonmandatory Information)

X1. TEST METHOD FOR LOW-TEMPERATURE BRITTLINESS OF RUBBER AND RUBBER-LIKE MATERIALS⁴

X1.1 Scope

X1.1.1 This test method is intended to determine the ability of compounds made from rubber or rubber-like materials to resist the effect of low temperatures that may cause them to become brittle and fracture or crack when bent. Standard specimens are exposed to specified low temperatures for definite periods after which the specimens are bent in a prescribed manner and any fracture or cracking noted. The procedure is commonly called the "Thiokol" method.

NOTE X1.1—Results obtained by this test method are influenced by the rate of flexing of the cooled specimens which can not be closely controlled in the prescribed apparatus. They are therefore of a qualitative nature and may not be closely reproducible over a range of several degrees of temperature depending on the speed of flexure. For more accurate determination of brittle temperature, and particularly in new specifications, Test Method D 746 is recommended.

X1.2 Apparatus

X1.2.1 *Cold Chamber*, of sufficient size to contain the flexing fixture when loaded with specimens, and so arranged as to permit the operation of the fixture to bend to specimens without removal from the chamber. It shall be capable of maintaining within it a uniform atmosphere of cold, dry air or a mixture of air and carbon dioxide at specified temperatures within a tolerance of $\pm 1^\circ\text{C}$ (2°F).

NOTE X1.2—Temperatures of -40°C (-40°F) and -55°C (67°F) are commonly used.

X1.2.2 *Flexing Fixture*, consisting of two parallel plates each having a width of at least 50 mm (2 in.) so supported in guides that they may be rapidly moved from a position 63 mm ($2\frac{1}{2}$ in.) apart until they are separated by a distance of 25 mm (1 in.). Suitable clamping bars or devices shall be provided for holding the ends of the specimens for a distance of 6.4 mm ($\frac{1}{4}$ in.) at the corresponding edge of each plate so that when mounted, the specimens form similar bent loops between the plates. A satisfactory flexing fixture is shown in Fig. X1.1.

X1.3 Test Specimens

X1.3.1 The test specimens shall conform in shape to Die C as specified in Methods D 412 and shall have a thickness of 2.032 ± 0.254 mm (0.080 ± 0.010 in.).

X1.3.2 At least two specimens from each compound shall be tested.

X1.4 Procedure

X1.4.1 Mount the test specimens in loop position between the plates of the flexing fixture with the enlarged ends spaced at least 3.2 mm ($\frac{1}{8}$ in.) apart and held in the clamps for a distance of 6.4 mm ($\frac{1}{4}$ in.). With the plates in the open position separated 63 mm ($2\frac{1}{2}$ in.), place the fixture containing the specimens in the cold chamber and expose it for the specified period to cold, dry air or a mixture of air and carbon dioxide at the specified temperature. The standard exposure period shall be 5 h (Note X1.3). At the termination of the exposure period and while still in the cold chamber, move the plates of the flexing fixture as rapidly as possible from the 63-mm ($2\frac{1}{2}$ -in.) distance of separation to a position where they are 25 mm (1 in.) apart. Then examine the specimens for fracture or visible cracks.

NOTE X1.3—Previously two periods were specified, 96 h for natural-rubber compounds and 5 h for synthetic-rubber compounds. It was found that 5 h is adequate for either class of compounds within the intent of this test method.

X1.5 Results

X1.5.1 When two specimens are tested and neither one fractures nor shows cracks after being tested, the compound shall be considered as having passed the brittleness test. If both specimens crack, the compound shall be considered to have failed.

X1.5.2 If only one specimen fractures or cracks, the result is inconclusive and two additional specimens shall be tested. If either one of these cracks, the compound shall then be considered to have failed.

X1.6 Report

X1.6.1 Report the following:

X1.6.1.1 The results of the test expressed as "passed" or "failed."

X1.6.1.2 The temperature of the cold chamber,

X1.6.1.3 The duration of the exposure period,

X1.6.1.4 Identification of the material tested including description of any special treatment prior to test, and

X1.6.1.5 Data of manufacture of the material, if known, and date of test.

⁴ This test method was originally issued in 1943 under the designation D 736 which was discontinued in April 1967.

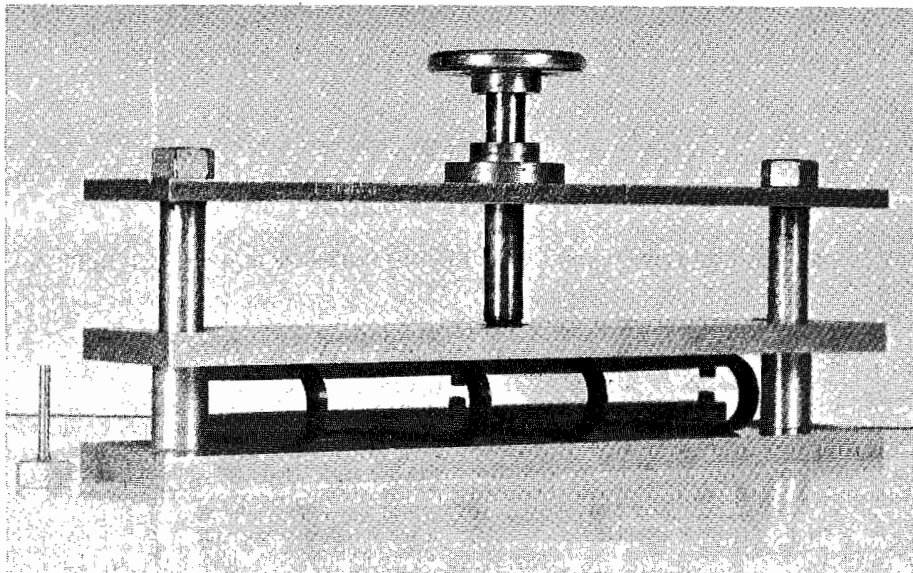


FIG. X1.1 Flexing Fixture for Low-Temperature Brittleness Test

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.